

**JP 49-74278**

**Applicant: ASAHI KASEI KOGYO KABUSHIKI KAISHA**

**Title: "Method for production of a casein sheet"**

**Claims:**

A method for producing an edible and soluble casein sheet, wherein a solution consisting mainly of 20-50 wt/vol % casein is formed and dried under conditions of the temperatures and concentrations shown in the shaded area enclosed by AEFD in Fig. 1.

**Examples:**

**[Example 1]**

3.7 kg of casein (KOKUSAN CHEMICAL Co., Ltd.) and 1.1 kg of glycerin were added to water to make 10 l, then while being heated to 80 °C and gently stirred, were adjusted to pH 7.2 with 40 % NaOH solution and defoamed under reduced pressure. The resulting casein 37 % stock solution was cooled to 65 °C, then fed to the drum surface through a 0.1-0.2 mm slit from the feeder placed on top of a teflon-coated drum drier, which is 260 mm in diameter and 300 mm in length. With a 60 °C surface temperature of the drier and a rate of 1 round per 5 minutes, uniform and foamless sheets 50-60  $\mu$  thick were obtained. In addition, after gently increasing the temperature of the drier, more foam generation occurred in the sheets over 80 °C. The resulting sheets were completely dissolved in 80 °C hot water within 10 seconds.

**[Example 2]**

22 kg of casein sodium (Wako Pure Chemical Industries, Ltd.), 5 kg of glycerin, and 50 g of soybean oil were added to water to make 50 l, then heated to 85 °C, while being stirred, and a highly viscous stock solution consisting mainly of casein was obtained. The solution was defoamed under reduced pressure, then the temperature was lowered to 65 °C. It was uniformly fed onto an iron drum drier 1.8 m in diameter and 1.5 m in width and having a surface coated with lacquer, so that the thickness reached 0.2 mm. By adjusting the surface temperature of the drier to 65 °C and the rate to 1 round per 4 minutes, uniform sheets of around 80  $\mu$  thick were obtained. These sheets were completely dissolved in the same hot water as in Example 1 within 10 seconds.

**[Example 3]**

22 kg of casein sodium (Wako Pure Chemical Industries, Ltd.), 11 kg of glycerin, and 50 g of rapeseed oil were added to water to make 50 l, then heated to 85 °C, while being stirred, and a highly viscous stock solution consisting mainly of casein was obtained. After defoaming the solution, the temperature was lowered to 65 °C, then fed to the drum surface through a 0.1 mm slit from the feeder placed on top of a melamine-coated drum drier which is 1 m in diameter and 1 m in width. The surface temperature of the drier was 60 °C and the rate was 1 round per 5 minutes. In addition, all operations in this case was kept at 20 °C and 15 % relative humidity by circulating the air through lithium chloride in the room. The resulting sheets were about 50  $\mu$  thick and had moderate plasticity at 15-50 % relative humidity, while they were too soft at 70-80 % relative humidity. When the solubility was tested under the same conditions as in Example 1, the sheets were dissolved almost instantly.

A 6 cm x 6 cm pouch was made from the resulting film, then 8 g of commercial ramen soup was heat sealed after it was sufficiently dried. This soup was wrapped with rehydratable noodles in a 12 cm x 16 cm polyethylene-polypropylene laminate film (40  $\mu$  thick, 4 g/m<sup>2</sup>/ 24 hrs Water Vapor Transmission Rate), and stored at 40 °C and a 90 % relative humidity in a desiccator for 18 days. During that time, neither color development in the casein sheet nor deliquescence of the soup were observed.

This result indicates that the sheets have a sufficient sustainable quality for the usual 6 months storage.

#### [Example 4]

15 kg of casein (KOKUSAN CHEMICAL Co.,Ltd.) and 4.5 kg of glycerin were added to water to make 50 l, then heated to 75 °C while being gently stirred, were adjusted to pH 7.6 with 30 % KOH solution, then cooled to 45 °C after defoaming. The operation was conducted while adding the solution to a storage tank (400 mm long, 300 mm wide and 300 mm deep) placed at the bottom of a teflon-coated drum 260 mm in diameter and 300 mm in length, so that the bottom of the drum was filled to a 2-5 cm depth. The thickness was adjusted by passing the solution through the thickness adjustment plate immediately after the solution was attached to the drum. The drum temperature was 43 °C and the rate was 1 round per 6 minutes. Various 40-100  $\mu$  thick sheets were obtained. Each of the sheets was completely dissolved in 80 °C hot water within 10 seconds.

#### [Example 5]

Apart from adjusting the temperature of the stock solution to 55 °C, attaching the

stock solution to the drum surface at a thickness of about 0.4 mm while adjusting the roll feeder, and setting the drum rate to 1 round per 8 minutes, the same conditions as in Example 2 were used, and casein sheets of around 150  $\mu$  thick were obtained. These sheets were completely dissolved in 80 °C hot water within 15 seconds.